

ART. XII.—*The Magnetic Shoul near Bezout Island, off
Cossack, N.W. Coast of Australia.*

By R. L. J. ELLERY, C.M.G., F.R.S., F.R.A.S.

Government Astronomer, Melbourne.

[Read Oct. 8, 1891.]

In *Nature* of March 19, 1891, p. 471, Commander E. W. Creak, R.N., states that in September 1885, on board H.M. surveying ship "Medea," when passing Bezout Island, near Cossack, N.W. Australia, a steady deflection of the compass of 30° was observed, whilst the ship was running over in a N.N.W. direction, and a depth of 8 fathoms of water.

When the "Penguin" surveying ship was in Hobson's Bay last Autumn, Lieutenant Coombe made magnetic determinations at our Observatory to test his instruments, and he described to me the experience of their vessel, the "Penguin," when at Bezout Island in November last year. The "Penguin" being two miles from the Island N. 79° E., a deflection of 22° was noticed in her compasses. On Bezout Island itself, the dip was normal, viz., $50^\circ 2'$ S., but 2.14 miles N., $79\frac{1}{2}^\circ$ E. from the island, the needle dipped to 83° with very small deflection of the compass. This was, no doubt, nearly vertically over the disturbing force. The compass deflection increased, first on one side, and then on the other, as the magnetic centre was approached, within a hundred feet or so, or left behind a like distance.

So remarkable a phenomenon has attracted a good deal of attention, and I believe Captain Moore, the Commander, received instructions from the Admiralty to further investigate this abnormal magnetic disturbance. At all events, the "Penguin," on leaving this port, went back to Western

Australia and Bezout Island, and Captain Moore has made a thorough magnetic survey of the locality, and in a letter dated 22nd June this year, has sent me a copy of the official account of his work. As this subject will be interesting to the Society, and of importance to our nautical men going west about to Northern Australia, or the Straits, I now give Captain Moore's account verbatim:—

MAGNETIC SHOAL NEAR COSSACK, W.A.

The area of magnetic disturbance near Cossack, exhibits the characteristics of red magnetism, as if there was a congestion or concentration of the magnetic elements, due to the Southern Hemisphere. It seems appropriate, therefore, to call it a "Magnetic Shoal"; and to treat it graphically, as if it was an elevation of the bottom of the sea or area of "shoal" water, the soundings being the "deflections" of the compass needle.

Worked out thus, it was found that the magnetic shoal developed the following features:—(1) An area 4 miles long north-east, and south-west by 2 miles broad; with a depth of 8 to 9 fathoms at low water springtide; bottom, quartz sand, over which the compasses are deflected one degree or more.

Within the above, an area 3 miles long north-east and south-west, by half a mile to $1\frac{1}{2}$ miles broad, over which compasses are disturbed half a point or more.

Within the above:—(1) A line of maximum easterly repulsion, about $2\frac{1}{4}$ miles long, over which the north-seeking end of the needle is violently repelled to the east, in several places over 40° , and in one place 56° . (2) A line of maximum westerly repulsion, about $2\frac{1}{4}$ miles long, over which the north-seeking end of the needle is repelled to the west, to the extent of about one-half the easterly repulsion. (3) Between these two lines, which are from 200 yards to 600 yards apart, a line of no repulsion $2\frac{1}{4}$ miles long, over which the needle points to the true north, and the direction force is very small. This is called the "axis," or "line of vanished repulsion." (4) A point on this line, about one mile from the south-west end of the magnetic shoal, where the intensity is greatest, which is called the "focus." The axis, or line of vanished repulsion, is inclined to the true

meridian, at an angle of 56° , in the neighbourhood of the focus. This angle coincides with the angle of maximum easterly repulsion.

A vessel passing in a straight line across the magnetic shoal at the focus, on a north-westerly course, would find the north-seeking end of the needle behave in the following manner:—When about 1 mile from the focus, a slight disturbance would be observed, the north-seeking end of the needle being repelled to the east; but this disturbance would not amount to more than half a point, until she had run to within 500 yards of the focus; the needle would then be more and more repelled, until 300 feet from the focus, when it would be deflected as much as 56° from the true north. It would then quickly resume its correct position, and over the focus—for a hardly appreciable distance, say 8 feet—would point true to the north. After passing the focus, it would be repelled to the west, and at 200 feet from it, would be deflected as much as 26° . It would now begin to return again to its proper position, and at 600 yards from the focus on the north-west side, would not deviate from the normal more than half a point. At one mile from the focus, all signs of disturbance would disappear. Crossing the shoal rectangularly, elsewhere than at the focus, similar, but less powerful repulsion would be observed. The distance between the largest east and largest west repulsion would be greater.

In a wooden ship or composite vessel like the “Penguin,” the compasses would act as usual after leaving the shoal. Whether or not induction would take place in an iron vessel, is a matter yet to be ascertained. At present there is no evidence of danger to navigation, except that a vessel steering by compass across the shoal would be set out of her course, more or less, according as to whether she cut across it at the narrowest part, or obliquely.

The focus is in latitude $20^\circ 32' 35''$ S., longitude $117^\circ 13' 2''$ E. from it. Bezout Island summit bears S. $78^\circ 49'$ W., distance 2.17 miles. The greatest range in deflection was 82° , after applying the deviation for the apparent position of the ship's head; the actual traverse of the card 86° . The greatest inclination or dip of the needle was $81^\circ 10'$. The greatest intensity or total force found was 18.808 (British units), or nearly double the intensity, which, in this locality,

is due to the earth considered as a magnet, *i.e.*, the magnetic attraction is such as to draw a weight of 1 grain, 18·808 feet in 1 second, in opposition to the force of gravity.

The statement made by Captain Creak, F.R.S., the Superintendent of Compasses, that the north-seeking end of the needle is repelled from the disturbing cause in the South Magnetic Hemisphere, is fully confirmed by this investigation.
